COMPLICATIONS DURING HEMODIALYSIS THEIR TREATMENT AND OUTCOME

THESIS

FOR

DOCTOR OF MEDICINE

BUNDELKHAND UNIVERSITY
JHANSI (U.P.)

2002 NAVEEN CHANDRA BHATT

CERTIFICATE

This is to certify that the work, entitled " ***COMPLICATIONS DURING HEMODIALYSIS. THEIR TREATMENT AND OUTCOME*** *, which is being submitted as a thesis for M.D. (Medicine) examination 2002 of Bundelkhand University has been conducted by* ***Dr. Naveen Chandra Bhatt*** *under my supervision & guidance. The techniques enbodied in the thesis have been undertaken by the candidate himself & the observations recorded were checked & verified by me from time to time.*

Dated : 23/2/2002

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Acknowledgement

On this day I try to acknowledge my deepest gratitude from the base of my heart although I teribly face short of expressing my feelings into the poverty of words.

I consider it a privilage to express a deep sense of gratitude & indebtness to my guide Dr. P.K. Jain , M.D. MNAMS, Professor , Department of Medicine , M.L.B. Medical College, Jhansi for the untiring help , able guidance, valuable suggestions, careful supervision provided by him during entire period of this study.

I am really very lucky to have had an opportunity to work under him. It would be not an exaggeration but for his endless patience and above all his affectionate nature, heartening words and his dedication to provide me with every opportunity to learn the subject otherwise I could not have completed this project. Things I have learnt from him will help me through out my career.

In no less degree I express my sincere thanks to my Co-guide Dr. N.S. Sengar, DM (Nephrology) Lecturer, Department of Medicine, M.L.B. Medical College Jhansi. who gave me encouragement, suggestions and close supervisions.

I wish to express my humble gratitude to my esteemed learned teacher Dr. R.C. Arora, M.D, D.Sc. Professor & Head Department of Medicine, M.L.B. Medical College, Jhansi. I am indebted to him for sharing with me his treasure of knowledge and experience.

It gives me great pleasure to express my sincere thanks to Dr. Navneet Agarwal, M.D. Professor, Dr. Praveen Kumar , MD,DM (Cardiology) Professor for their valuable suggestions provided me time to time.

I also pay my respect to my parents for their constant inspiration & blessings.

I also wish to express my heart felt thanks to Mr. Rajendra Kumar Rai (Priyanka Computer Graphics) for his excellent type writing and sincerity which made it possible to present the work in this form.

Finally I thanks all those whose names could not be mentioned here & who helped me at all stages of this work.

Dated : 23/2/2002

(Naveen Chandra Bhatt)

Contents

Introduction

INTRODUCTION

COMPLICATIONS DURING HEMODIALYSIS

Few who witnessed the early days of hemodialysis could have foreseen the spectacular development of hemodialysis that thas occurred since then. Initially the process was fraught with danger was extremely labour and material intensive and highly stressful for patient and staff. Hemodialysis is so safe relative to first attempts, that most dialysis staff assume the patient will complete each treatment without complications. Ultrafiltration control, bicarbonate bufferred dialysate, bicompatible membranes more sophisticated machines, heparin modelling are examples of these improvement. However, technology can also lead to new complications. High efficiency and high flux dialysis while permitting shorter treatment in some patient have also created new problems related to rapid fluid and solute removal. Because of intermittent nature of dialysis, the short

duration of treatments, the use of an artificial membrane and requirement of extra-corporeal circulation, intradialytic complication are not uncommon. Much work yet remain to be done if hemodialysis is to be made truly complication free.

Complications during hemodialysis

1. Intradialytic hypotension
2. Intradialytic hypertension
3. Cardiac arrhythmias both atrial and venticular
4. Dialysis disequlibrium syndrome
5. Allergy-Hypertensively to any heparin formulation.
6. muscle cramps
7. Vomiting
8. Headache
9. Hearing disturbances
10. Itching , Fever, Headache , Chest pain
10. Dialysis accident - Hemorrhage
    Air embolism
    Thrombosis.

Indications of Hemodialysis

Uraemic Indications	Nonuraemic Indications
1. Increased Plasma urea or creatinine concentration. In general a plasma urea grater than 185.5 mg/dl and creatinine 6.8 mg/dl are considerable but much depends on clinical and Biiochemical deterioration. 2. Uremic encephalopathy 3. Uraemic pericarditis	1. Hyperkalemia 2. Fluid over load 3. Drug intoxication 4. Hypothermia 5. Hypercalcemia 6. Hyperuricemia 7. Acidosis 8. Metabolic alklosis (Special dialysis solution requires)

Contraindication of Dialysis therapy -

1. Alzheimer's disease.
2. Multi infarct dementia.
3. Hepatorenal syndrome.
4. Advanced cirrhosis with enchephalopathy
5. Advance malignancy.

Other Conditions in which hemodialysis is not favoured

1. Infants or very young children.
2. Patient with severe cardiovascular disease.
3. Patient with difficult vascular access (Diabetes).
4. Patient who with to perform home dialysis, but who don't have a suitable partner to assist them.
5. Patients who desire greater freedom to travel (CAPD is favoured).

It is with this background the present study is was attempted to find out. -

1. Complications during hemodialysis.
2. Their treatment and outcome in patients coming at Dialysis unit of M.L.B. Medical College Jhansi.

Aims & Objectives

AIMS AND OBJECTIVES

To study

1- Complication during hemodialysis.

2. Their treatment and outcome.

Review of Literature

REVIEW OF LITERATURE

History of Hemodialysis :

1. The idea of removing solutes from body fluid by dialysis date back to beginning of 20th century.
2. The first experimental hemodialysis in dogs was performed by Abel et al at the Jhon's Hopkin Medical school in Baltimore.
3. The first hemodialysis was preformed by Georg Hass from Gieben Germany. He dialysed four patient with terminal renal failure between 1924 and 1928.
4. Haas found in 1925 that technical and anticoagulation problem limited the treatment and patient died from temporary improvement in uraemic condition.
5. Willen kolff at Groninger University Hospital in the Neitherland introduced the first dialyser suitable for human use in 1943.

6. The first patient whose life was saved by treatment with artificial Kidnèy was a woman with ARF.

7. In 1960 the arterio-venous cannula system was introduced as a vascular access for hemodialysis by Belding.

8. In 1966 scriloner created A.V. fistula.

INTRADIALYSIS HYPOTENSION

Common causes of hypotension.

1. Related to excessive decrease in blood volume.
   (i) Fluctuation in Ultrafiltration rate.
   (ii) High Filtration rate.
   (iii) Dialysis solution have low sodium.
2. Related to lack of vasoconstriction
   (i) Antihypertension medication.
   (ii) Accetate containing dialysis solution.
   (iii) Dialysis solution that in relatively too warm.
3. Cardiac Cause

Failure to increase cardiac rate under condition of decrease filling.

1. Aging
2. Uremic autonomic neuropathy
3. MI
4. Septicemia
5. Pericardial temponade
6. Occult Hemorhage.
7. Arrhythmias.

- Hypotension complicates hemodialysis in 20% - 50% of treatment - Degoulet P., Reash I. Diginlio et al Epidemiology of dialysis induced Hypotension Proc. Eur. Dial. Transport Assoc. 1981 - 133-138.
- According to a study in 'clinical dialysis' done by Richard Amering, Gil.A. Cu, Alan Dubrow, Nathan, W. Levin Raphel I. Osheroff 3rd eds 1995 223-240. Intradialytic complication by patient age; % of treatment with specific symptom.

Age (Years)

Number of treatment	**<30**	**30-50**	**51-70**	**>70**
	1314	**5355**	**11085**	**4800**
Percentage of treatment with				
1.Hypotension	18.1	19.7	25.2	34.0
2. Nausea	8.0	6.8	8.1	8.8
3. Vomiting	3.4	2.3	3.7	6.2
4. Cramps	11.4	13.3	10.2	6.7
5. Chest pain	0.9	1.2	1.5	1.3
6. Fever	0.6	0.2	0.2	0.1

2. Study done by same

Number of treatment associated with Hypotension and number of Hypotension requiring intervention.

Number of treatment	***1314***	***5355***	***11085***	***4800***
Percentage of treatment with hypotension	18.1	19.7	25.2	34.0
Hypotension requiring intervention	11.2	12.5	17.3	21.7

- Acetate used in dialysis units has vasudialator effect- causing hypotension. Pagel MD, Ahmads, Vizzo Je, Scribner BH, Acitate and bicarbonate, fluctuation and acetate intolerance during dialysis. Kidney Int. 1982, 513-518.

- Lowering dialysate temperature has been reported to decrease the number and severity of hypotensive episode in dialysis patients.

By Maggore Q., Pizzarelli F. Sisca et al : Blood temperature and vascular stability during hemodialysis and Hemofiltration ASAIO 1982 : 523-537.

INTRADIALYTIC HYPERTENSION

Causes of intradialytic hypertension

1. Pre-existing hypertension
2. Volume overload
3. Increase alpha sympathetic activity.
4. Hypercalcemia - increae inotropy and vascular tone.

5. Increase Hct - increase blood viscosity - increase peripheral resistance.
6. Reversal of hypoxia induced vasodialation.
7. Hypokalemia / volume deplition - increase renin angiotensin.

- A minority of patient (10%- 30%) experience rising blood pressure which can sometimes be dramatic over course of dialysis-Rosa AA, Fiyd D.S., Kjellstrand CM:Dialysis symptoms and stabili-zation in long term dialysis : Practical application of sum plot Arch Intern Med 1980 140:804-8 0 7.
- Hypokalemia may stimulate renin secretion independent of volume changes in rats and humans causing hypertension. Fellnr SK., Intra-dialytic hypertension II Semin Dial 1993 371-373.
- Rising ionised calcium level increase myocardial contractility , left venticular stroke volume and cardiac output. Increase peripheral vascular resistance

Fellnr SK., intradialytic hypertension II Semin Dial 1993 371-373.

Cardiac Arrhythmias both atrial and venticular

The near absence of arrhythmias is paediatric dialysis population and low prevalence in adults without coronary artery disease or LVH indicates dialysis treatment per se is not arrhythmogenic.

Contributing factors to intra dialytic arrhythmias include LVH (especially in presence of digitalis), CAD, Hypokalemia.

- Eighty percent of recorded sudden deaths in intradialytic period are due to ventricular fibrillation Chazan J. Sudden deaths in patients with CRF on hemodialysis , Dial transplant 1987 447-448.
- Dialysis treatment with fluid removal may omelliorate myocardial perfusion and thus anti arrhythmic Wizemann V ., Kramer W. Cardiac arrhythmia in end stage renal disease : prevalence

risk factors and management In : Parfrey PS . Harwett JD, eds. Cardiac dysfunction in chronic uremia, Norwell, Mass : kluwer Academic 1991, 66-79.

- Atrial and ventricular arrhythmias are common during hemodylysis.

Kant KS : Intradialytic cardiac arrhythmia II Semin Dial 1994 7 : 58-60.

DIALYSIS DISEQUILIBRUM SYNDROME -

Dialysis disequilibrum syndrome is an acute disorder of central nervous system in patients with end stage renal disease treated with haemodialysis Individuals with pre-existing neurological disorders such as stroke , head trauma, sub-dural hematoma or malignant hypertension are at increased risk. Restlessness, headache , nausea vomiting dis-orientation and tremer, seizues and coma. Symptoms usually occur towards the end of dialysis session but may be delayed for upto 24 hrs.

Cause: Brain osmolarity exceeds that of plasma leading to cerebral edema -

- Individual with preexiting neurological disorders such as stroke, head trauma, sub-dural hemotoma or malignant hypertension are at increased risk of DDS.

Peteron HD, Acute encephalopathy occuring during hemodialysis. Arch Intern Med 1964 ; 113 ; 877-880

- Port FK Johason WJ, Klass DW. Prevention of dialysis DS by use of high sodium concentration in dialysate kidney Int 1973 : 327-333. Demonstration that DDS occur in maintenance hemodialysis patients.
- Full blown disequilibrium syndrome has become rare in recent years Improvements in dialysis delivery technology including bicarbonate dialysate, high dialystate sodium concentration

and controlled hypperfiltration are responsible for decreasing frequency and severity of DDS.

Graefe V, Milutinovids ui,Follete WC et al , less dialysis induced morbidity and vascualr instability with bicarbonate dialysate. Kidney int. 1978-88: 332-336

- Arieff AI. Dialysis disequilibrium syndrome : Current concept on pathogenesis and prevention. Kidney Int. 1994; 45:629-635 demonstrated rapid hemodialysis may induce disequilibrium stage characterized by increased CSF pressure fall in CSF pH and bicarbonate concentration.

NAUSEA AND VOMITING

Most episodes in stable patient are propably related to hypotension it is also part of disequilibrium syndrome.

HEADACHE

Headache is common symptom during dialysis -

1. May be part of disequilibrium syndrome.

2. May be related to use of acetate containing dialysis solution

3. In Coffee drinker may be due to caffeine withdrawal.

CHEST PAIN AND BACK PAIN

The most common cause of chest pain is "First-use syndrome".

FEVER

Causes are

1. Temporary vascular access infection.

2. Permanent vascular access infection.

Microbe responsible

- Staphylococci and streptococci
- Some time diphtheriods and gram negative bacilli.

- Report indicate higher risk of pyrogenic reaction in units that reprocess high flux dialyzers compared with units that reprocess cellulosic membrane.

Back-sogue CM, Jarvis WR, Bland LA et al : Outbreak of gram negative bacteremia and pyrogenic reaction in a hemodialysis centre. Am J nephrol 19990 : 10 : 397-403.

- Fibrile reaction usually begins short after the initiation of dialysis and may resolve spontaneously over the course of treatment.

Polaschegg HD, Kaufman Am, Levin NW, Mechanical malfunction during dialysis In : Nissenson AR, Fine R,eds Dialysis therapy. Philadelphia Pa : hamley and Belfus 1993 :100-104.

OTHER COMPLICATIONS

Hyperglycemia -

Hyperglycemia is common during dialysis and may be due to positive glucose balance that occurs when glucose containing dialysate is used.

Gatiesserz A, Bergstrom J, Alvestrand A : Hemodialysis associated protein catabolism with and

without glucose in dialysis fluid. Kidney Int. 1994, 46: 814-822.

The use of high glucose dialysate (>200mg%) can lead to net gain of 10-100 gm of glucose. The resulting hyperosmalarity in the absence of insulin can precipitate hyperkalemia in post dialytic period. Esforzado N., Poch E, Casis C, et al central pontine myelinolysis secondary to treatment and rapid stuff in plasma glucose in diabitic hemodialytic patient. Transplantation 1992 : 744- 746.

Hypoglycemia -

Hypoglycemia is multifactorial

Alcohol abuse , liver disease and prolonged digradation of Insulin or oral hypoglycemic agents may contribute to inter and intradialytic hypoglycemia use

Use of glucose free dialysate can produce a net flucose loss of 3 gm during hemodialysis. Gracjower MM walter L. Arhins. Hypoglycemia in chronic dialysis

patients : association with propranolol use . Nephron 1980 : 26 ; 126-130.

Hyperkalemia -

Though difficult to predict for any given treatment, net removal of potassium per treatment is only in the range of 100 mEq, even with potassium free dialysate,

Plasma potassium level may rebound by upto 30% within 5 hour after completion of dialysis.

In a patient being treated for severe hyperlalemia the immediate post dialysis potassium levels should not be used to gauge effectiveness of treatment. level should be measured 2 or 3 hours leter.

Hypokalemia -

Life threatening muscular weakness and arrhythmias have been reported to occur as a result of intradialytic hypokalemia. Patient with marginal total body potassium store and severe acidosis are prone to these complications.

Alkalosis -

Clinical feature : Hypoventilation , Neuromuscular and CNs symptoms including confusion, obtundation stupar tetany ,seizures.

Acidosis -

The diagnosis is suggested by acute onset of hyperventilation during dialysis

Cause - Alcohol abuse .

- Diabetic ketoacidosis

- in proper mixing of concentrate.

Material & Methods

MATERIAL & METHODS

The present study was carried out in the dialysis unit of Department of Medicine M.L.B. Medical College, Jhansi. 50 patients of renal failure out of 9050 patients admitted in medical wards, surgical and Obst. & Gynae wards in last one year (December 2000 - December 2001) were selected for the study. Full history clinical examination and investigations were done of every patients admitted for hemodialysis in the dialysis unit.

Other material required -

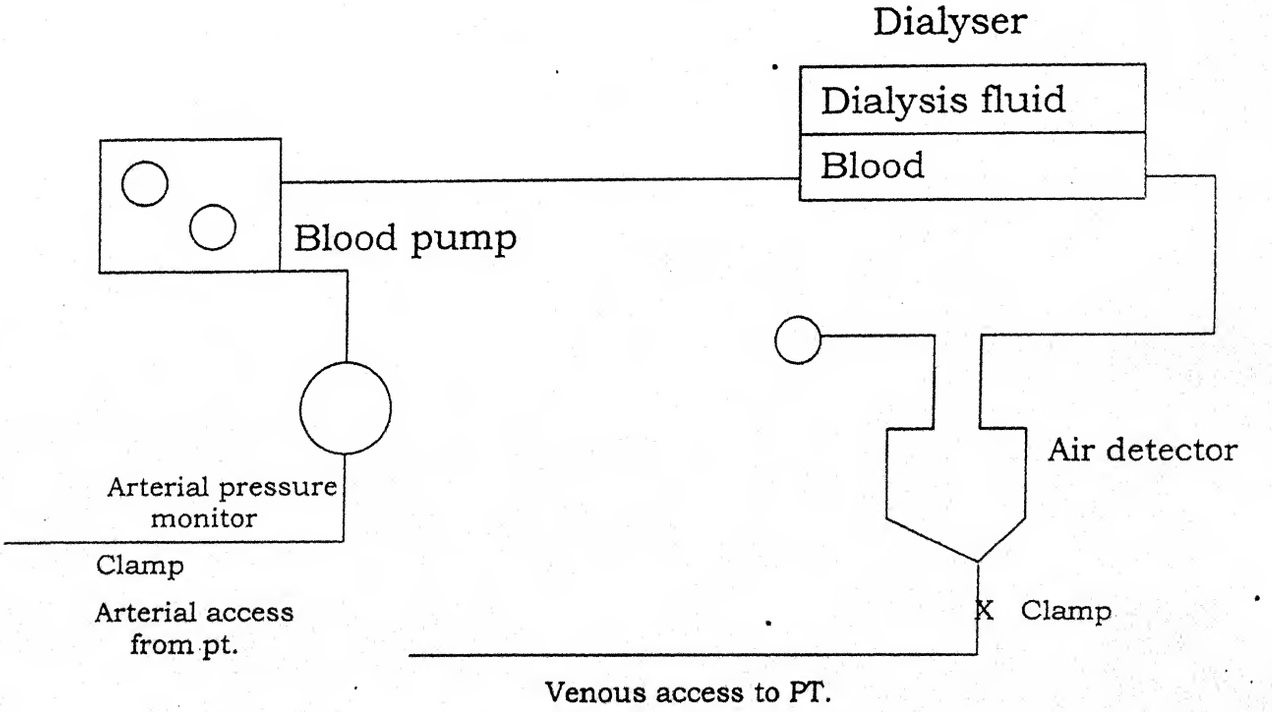
1. The dialyzer : We were using hollow fibre type of dialyzer.
2. Water for dialysis treatment.
3. Dialysis solution : We were using acetate solution.
4. Dialysis machines

Hemodialysis System :-

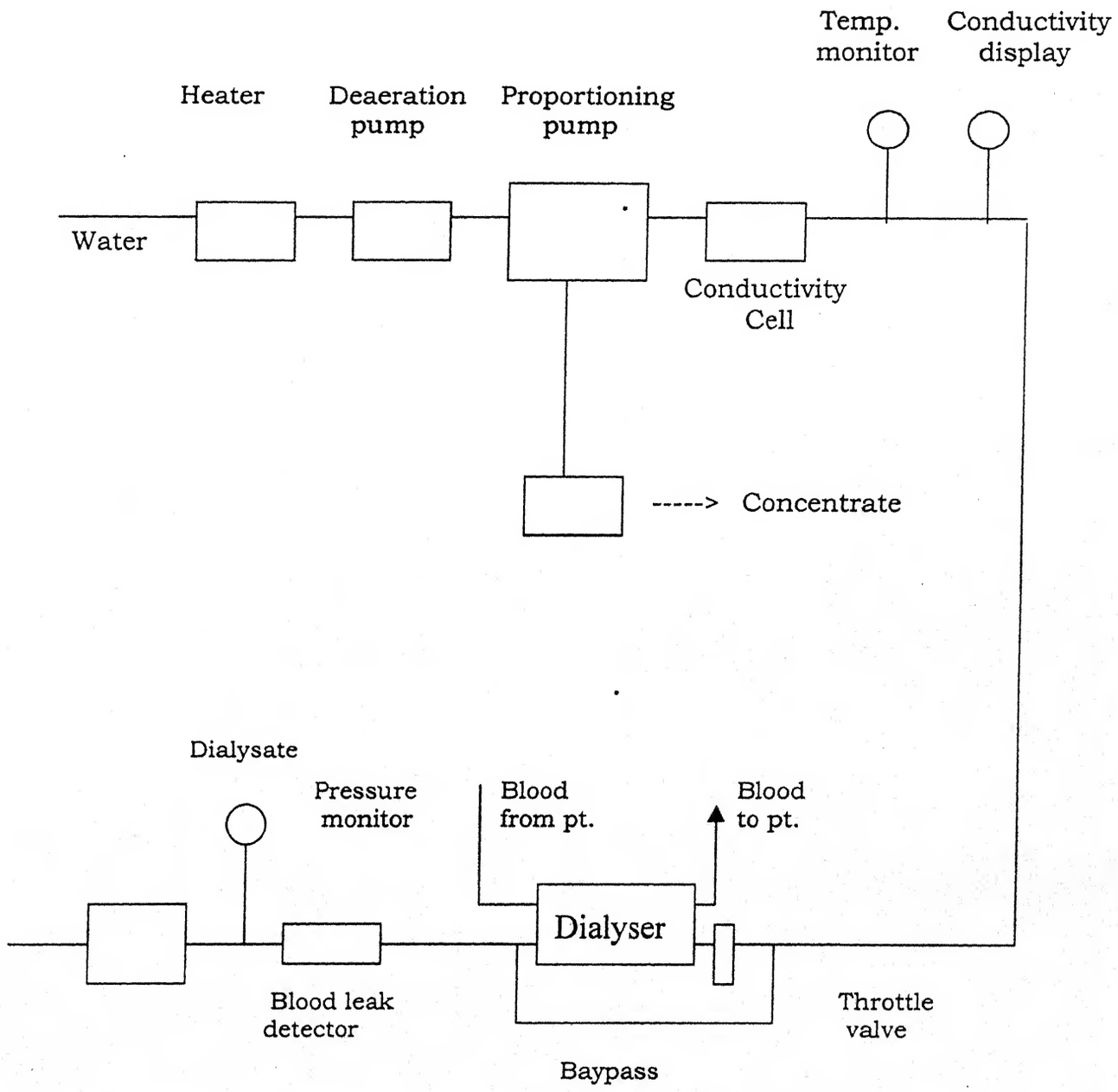
It includes blood circuit and dialysate circuit. Central part of both circuit is dialyser where waste

product, excess electrolytes and water are removed from patient's blood. Dialysis fluid and blood are pumped through dialyser in counter current director separated by semi-permeable membrane. The blood flow compartment is monitored to control the pressure flow and accidental entry of air into blood circuit, in dialysis fluid compartment the composition of dialysis fluid flow, pressure and accidental entry of blood in dialysate due to rupture of dialyser membrane need to be monitored.

Blood Circuit



Dialysis fluid circuit



Other material required -

- Access needle
- Blood tubing
- Heparin pump.

Examination

After putting pt. on Hemodialysis system , we have to do intensive monitoring of patient from start to end.

Monitoring includes -

1. B.P. Monitoring every 30 min.
2. Pulse rate monitoring.
3. ECG monitoring.
4. To see any accident at start of dialysis which include -

   - Hemorrhage,
   - Thrombosis,
   - Stenosis.
   - Air embolims.

   during putting cannula

5. Look for -
   - Vomiting,
   - Nausea,
   - Muscle Cramp,
   - DDS,
   - Allergy,
   - microbial contamination : Fever, Shivering etc.

6. Close monitoring of volume overload.
7. Give full attention to every complaint made by patient
8. To check hemodialysis system/dialysate.
9. To check anticoagulation disorder during hemodialysis by BT, CT platelet count, whole blood partial thromboplastin tie (if needed).

Collection and storage of sample

1. Pre-dialysis sample 10 ml before start of dialysis for -

    S. Na^+

    S. K^+

    pH

    Blood sugar,

    Blood urea,

    S. Creatinine.

2. Collect 10 ml sample after dialysis for same.

It any complication occur during dialysis, then to manage it accordingly and then to find out its outcome.

Observations

OBSERVATIONS

The present study was carried out in the dialysis unit of Department of Medicine M.L.B. Medical College Jhansi. 50 patients of renal failure out of 9050 patients admitted in medical wards, surgical and obst / Gynae wards in last 1 year (Dec 2000 to Dec 2001). Full history, clinical examination and investigations done .

TABLE - 1

Distribution of patients according to the Age and Sex

Age	Sex		Total	%age
	Male	Female		
< 20	4	5	9	18%
20 - 40	7	9	26	52%
41 - 60	12	6	18	36%
> 60	4	3	2	14%
	27	23	50	100%

The minimum age recorded was (16y) and the maximum age was (72y). Maximum number of patients 26 (52%) were belonging to 3rd and 4th decade. 27 (54%) were male and 23 (46%) were female.

TABLE - 2

Distribution of patient according to their Marital Status

Marital Status	Number	Percentage
Unmarried	11	22%
married	39	78%
Total	50	100%

Table II shows that total number of married cases was 39 (78%) and unmarried 11 (22%).

TABLE - 3

Distribution of patient whether Hypertensive or not

	Number of patients	Percentage
Hypertensive	11	22%
Non-Hypertensive	39	78%
Total	50	100%

Table III shows 11 (22%) patients were hypertensive and rest 39 (78%) were normotensive .

TABLE - 4

Distribution whether diabetic / non diabetic

	Number of patients	Percentage
Diabetic	8	16%
Non Diabetic	42	84%
Total	50	100%

Table IV shows that 8 (16%) patients were diabetic and rest were non diabetic .

TABLE - 5

Department wise patient distribution who presented to Dialysis Unit.

Department	Cases	Percentage
Medical	40	80%
Surgical	2	4%
Obstr/	8	16%
Total	50	100%

Table V shows that 40 (80%) patients were from medicine ward, 2(4%) from surgical wards and 8 (16%) from obst/Gynae. ward.

TABLE - 6

Shows the Serum Creatinine Level.

S. Creatinine Level	Number	Percentage
1.5 - 3	2	4%
3.1 - 7	21	42%
> 7.1	27	54%
Total	50	100%

Table 6 shows that 21 (42%) patients were having S. creatinine in the range of 3.1 to 7 meq/L. and 27 (54%) were having S. Creatinine in the range of more than 7.1 meq/L, only 2(4%) had S. Creatinine level in the range of 1.5-3 meq/L.

TABLE - 7

Distribution of patient according to concentration of Blood urea level.

Blood Urea (mg%)	Number of Patients	Percentage
< 50% mg%	0	0%
50.1 - 100	1	2%
100.1 - 150	6	12%
150.1 - 200	32	64%
200.1 - 250	11	22%
Total	50	100%

According to the table 7, 32 patient (64%) maximum number of patient presented for dialysis were having blood urea level between (150mg% to 200 mg%).

TABLE - 8

Shows Serum level potassium levels (n=50)

S. Potassium Level (meq/L)	Number of Patients	Percentage
3 - 5.5	23	46%
5.6 - 7	26	52%
> 7	1	2%
Total	50	100%

Normal values of Serum K^+ - 3.5 to 5.5 meq/L

Most of Patients presented to dialysis unit were having 5 K^+ > 5.5

TABLE - 9

Distribution of patient according to size of Kidney

Kidney Size	No. of Patients	Percentage
Normal Kidney	22	44%
Bilateral Contracted Kidney	28	56%
Total	50	100%

Table 7 shows that 22(44%) patients were having normal size kidney whereas 28(56%) were having Bilateral Contracted kidney i.e. kidney size less than 8.5 cm.

Patient with B/L contracted kidneys were all of CRF.

2 patients of normal size kidney with diabetes were also patients of CRF.

Rest 20 (40%) were patient of ARF.

TABLE - 10

Table showing routine and microscopic finding in urine

Urine Examination (Routine & Microscopic)	No. of Pts.	Percentage
Nil	17	34%
Albumin (+,++,+++)	25	50%
RBC > 5	11	22%
Pus cell	9	18%
Crystal	1	2%
Sugar	12	24%
Cast	7	14%

Table 10 shows 17 (34%) of patient had their urine - routine and microscopic examination within normal limits. 25(50%) patient had albumin in urine 11 (22%) had RBC > 5 in urine, 9 (18%) had pus cell in urine , 1(2%) had crystals, 12 (24%) have sugar and 7(14%) have granular cast in urine.

TABLE - 11

Distribution showing change in fundus examination

Fundoscopic Examination	No. of Patients	Percentage
Diabetic Retinopathy	7	14%
Hypertensive Retinopathy	7	14%

Table IX shows 7(14%) patient had Diabetic retinopathy and 7 (14%) Patients had hypertensive retinopathy.

TABLE - 12

Distribution of patient according to complications during hemodialysis

	No. of patient	Percentage
Without Complications	22	44%
With complication	28	56%

Table X shows that complications during hemodialysis were presented in 28 (56%) patient and 22(44%) completed dialysis without any complications.

TABLE - 13

Distribution of Pt. According to incidence of complication during hemodialysis

Complications	No. of patient	Percentage
Hypotension	7	14%
Hypertension	1	2%
Nausea	7	14%
Vomiting	4	8%
Dialysis disequlib-rium syndrome	2	4%
Fever	3	6%
Arrhythmias	1	2%
Headache	2	4%
Chest pain	0	0%
Hypoglycemia	1	2%
Bleeding	1	2%
Itching	2	4%
Muscle Cramps	1	2%

According to table XIII maximum number of complication were in the form of hypotension i.e. 7(14%) and nausea 7 (14%) followed by vomiting & 4(8%), fever 3(6%). Only a few patients had complication in form of :

Arrhythmias	1 (2%)
Hypoglycemia	1 (2%)
Hemorrhage	1 (2%)
Itching	1 (2%)
Muscle cramps	1 (2%)
Acidosis	1 (2%)

TABLE - 14

Patient who completed dialysis Successfully

	No. of Patients	Percentage
Patient who completed dialysis successfully	50	100%
No. of death duing dialysis	0	0

Table XIV shows that there was no mortality during dialysis. All patients despite of complication completed dialysis successfully.

Discussion

DISCUSSION

The present study was carried out on 9050 patients admitted in the medical wards, surgical and Gynae and Obstr. wards of M.L.B. Medical College, Jhansi in last one year (Dec. 2000 to Dec. 2001). 50 patients were presented to dialysis unit in the Department of Medicine. These patients constituted the material of the present study.

Out of these 50 patients 27 (54%) were male and 23 (46%) were female. Maximum number of patients 26 (52%) were between 20 to 40 years. 18 (36%) were between 40-60 years. Youngest patient who had under gone dialysis was of 11 year old female, Oldest was 72 years old male. 39 (78%) patients out of 50 were married remaining 11(22%) were unmarried.

Maximum number of patient for dialysis was 40 (80%) from medical ward, followed by 8 (16%) from Obst./Gyne and 2 (4%) from surgical wards.

Y.J. Anupama (1995) reported in a study of Karnataka that out of 80 patietns : 64 (80%) were due to medical cause and 10 (12.5%) due to surgical cause and 6(7.5%) due to Obstetric ARF among the medical causes acute gastroenteritis was the most common cause of medical ARF.

11 (22%) patient out of 50 were hypertensive and rest 39(78%) were normotensive. Hypertension is second most common cause of ESRD cases accounting for 30%. (Brenner and Rector's. The Kidney 6th eds. 2000).

8 (16%) patients were Diabetic and rest 42(84%) were Non Diabetic.

In the united states the leading cause of ESRD is diabetes mellitus, accounting for more than 40% of

newly diagnosed cases of ESRD : (Brenner and Rector's The kindey 6th edition 2000).

- On fundus examination 7 (14%) out of 50 patient were found to had changes of Diabetic retinopathy i.e. cotton wool appearance, micro-infarcts, neovascularization and 7 (14%) were found to had changes of hypertensive retinopathy i.e. A.V. nicking , altered A.V. ratio, exudates, hemorrhage, paplliedma.

On urine routine and microscopic examination 17 (34%) had no abnormality, 25(50%)had albumin in urine showing glomerular involvement,11(22%) had microscopic hematuria i.e. RBC > 5/hpf, 9 (18%) had pus cell showing infection,12 (24%) had sugar, and 7(14%) had granular cast

7(14%) patient in the study had blood urea level between 50-150 mg%, 32 (64%) between 150.1 - 200mg% and 11(22%) above 200 Mg%.

- In this study 21 (42%) were having S. creatinine in the range of 3.1 to 7meq and 27 (54%) were having S. Creatinine in the range of more than 7.1 meq, only 2(4%) had S. creatinine in the range of 1.5 to 3 meq.

Hyperkalemia (S. K^+ > 5.5 meq/L) was observed in 27 (54%) out of 50. 1(2%) had S. K^+ level more than 7 meq/L , rest 23 (46%) had normal serum K^+ level.

Ultrasound abdomen KUB region of patients shows that 28 (56%) patients out of 50 were having bilateral contracted kidney i.e. kidney size less than 8.5 cm. Patients of bilateral contracted kidneys were all of chronic renal failure.

22 (44%) patients were having normal size kidney, out of these 22 patients, 2 patients of normal size kidney with diabetes were also patient of CRF.

Rest 20 (40%) were patient of acute renal failure

Complications during hemodialysis

Their treatment & outcome

22 (44%) patients completed dialysis without any complication whereas 28 (56%) patients had complication during hemodialysis.

In this study 7 (14%) patients had hypotension during hemodialysis.

- Hypotension complicates hemodialysis in 20% to 50% treatment 'By' - Degoulet. Reach I. Digudio et al, Epidemiology of dialysis induced hypotension. Proc. Eur. Dial. Transplant Assoc 1981. 18 : 133-138.
- Richard Amering Gil. A Cu. Alan Dubrow, Nathan ,. Levin. Raphel Osheroff observed, hypotension during (complicates hemodialysis in18% to 34% of treatment. In Clinical Dialysis 2nd eds. Norwalk, Conn : Appledon and Lange ; 1990 ; 102 - 109).

A decline in blood pressure is observed regularly during hemodialysis treatments. There is falling blood

pres sure in 10% to 20% of treatment and a sharp rebound immediately after dialysis. Levin NIW, Kupin WL, Zasuwa G, Venkat K.K. Complications during hemodialysis. In : Clinical dialysis 2nd ed. Norwalk, Conn : Appleton and Lange ; 1990 : 172-201.

Possible causes of hypotension in this study :-

1. Use of acetate as dialyzing fluid. Acetate has marked vasodilator effect. The maximum rate of acetate metabolism is approximately 300mm/hr. During hemodialysis if acetate diffuses from dialysate to plasma at greater rate, It may cause hypotension, nausea, vomiting, disorientation and fatigue.

2. Hypotension was observed mainly in patient who were having some cardiac disease in form of CHF, CAD, LVH, etc., Out of 7 patients, who had hypotension, 5 were having these diseases. All these disease cause decreased myocardial contractility.

3. Another cause of hypotension may be antihypertensive drugs in form of ACE inhibitors, calcium channel blockers, β blocker. All 7 patients were taking antihypertensive. β blockers were particularly important as they cause bradycardia.

4. Cases of hypotension were observed more in summer months when temperature of this region goes well beyond 45°c and room temperature above 40°c Dialysate temperature above 37°c causes hypotension.

   Lowering dialysate temperature has been reported to decrease the number and severity of hypotensive episodes in dialysis patients. By Maggiore Q. Pizzarelli F., Sisca S, et al Blood temperature and vascular stability during hemodialysis and hemofiltration. ASAIO Trans 1982 : 28 : 523 - 537.

5. Aging was yet another factor that contribute to hypotension during hemodialysis in the study -

- All patient who were having hypotension were above 40 years of age.

Other factors contributing to intradialytic hypotension are .

1. Related to excessive decrease in blood volume.

   (a) Fluctuation in ultrafiltration rate.

   (b) High ultrafiltration rate.

   (c) Dialysis solution sodium too low.

2. Related to lack of vasoconstriction

   (a) Antihypertensive medications.

3. Related to cardiac causes

   Poor myocardial contraction due to age, hypertension MI, valve disease , atherosclerosis.

4. Septicemia

5. Occult haemorrhage.

6. Arrhythmias

- ***Strategy performed to treat hypotension during hemodialysis.***

  1. The patient was placed in Trendelenburg position (if respiratory status allow this)

2. A bolus of 0.9% saline (100 ml or more) was administered through the venous blood line.

3. Ultrafiltration rate was reduced.

4. Temperature of acetate was tried to bring close to 38°c (Ideal temperature 36-38°c)

5. Antihypertension medications were stop on dialysis day. All patients responded and completed dialysis successfully. No patient required to cessation of dialysis in between.

In this study 1 (2%) patient had hypertension during hemodialysis. A minority of patient (10% to 20%) may experience high blood pressure. Rosa AA. Fryd. D.S.Kjellstrand CM ; Dialysis Symptoms and stabilization in long term dialysis : Practical application of sum plot Arch. Intern Med. 1980 140: 804-897.

Richard Amerling, Gill A Cu. Alan Dubrow, Nathan W Levin, Raphael J. Osheroff reported in there studies that 2 week period in one of our dialysis units,

a rise of mean arterial pressure of 15mmHg or more. during or immediately post dialysis was observed in 8% of treatment (In Clinical Dialysis 3rd eds. Appleton and Lange ; 1995 : 241-242).

- ***In this study factors contributing to intradialytic hypertension.***

1. Removal of antihypertensive medications : Drugs like α , α/β blockers. ACE inhibiters, Calcium Channel Blockers β blockers are effectively removal by hemodialysis, This may contribute to hypertension.
2. In pre-existing hypertension the crosssectional area of peripheral vascular is functionally reduced by excess sympathetic tone and/or pressure hormones.
3. Fluid overload might also had contributed to hypertension in early phase of dialysis.

In this study we observed hypertension in 1 (2%) patient. The patient had systemic hypertension for last 10 years with CHF with fluid overload.

Other factors contributing to intradialytic hypertension

1. Pre-existing hypertension.
2. Volume overload.
3. Removal of antihypertensive drugs.
4. Hypokalemia/volume depletion ----- increases renin- angiotension ------ increases Na+ retention causes hypertention.
5. Hypercalcemia ---- Increases inotoroy and vascular tone --- causes hypertension.
6. Increase α sympathetic activity due to sudden change in blood volume.

Treatment of intradialytic hypertension

1. Oral nifedpine was given

2. Hemofiltration speed was increased patient responded to treatment and successfully completed dialysis.

In this study 7 (14%) patients had nausea and 4(8%) had vomiting during dialysis.

- Nausea and vomiting was reported in 5 - 15% cases undergoing hemodialysis. Harold Bregman, John T. Daugirdas. Todd S. Ing. In Handbook of dialysis : 1988 : 106-109.
- Nausea was reported in 6-8% patient undergoing dialysis - Richard Amerling. Gil A. Cu, Alan Dubrow, Nathan W., Levin, Raphael J. Osheroff. In Clinical Dialysis 3rd eds. 1995 : 235-237.

Possible causes of nausea and vomiting in this study were:

1. Rapid dialysis caused disequilibrium syndrome characterized by increase cerebrospinal fluid pressure and a fall of CSF PH and bicarbonate concentration. Brain osmolarity exceeds that of

plasma leading to cerebral edema. Nausea & vomiting were because of rapid hemodialysis.

2. Hypotension may also contribute to nausea.

3. When dializer is used for first time, it is more likely to cause nausea. may be a part of "first used syndrome" Characterized by anaphylactoid reaction against ethylene oxide altered proteins. Ethylene - oxide is used to sterilize most dialysers available today.

Treatment of Nausea and vomiting -

1. Inj metoclopramide.

2. Decrease the speed of blood pump.

Prevention of nausea vomiting -

1. Properly rinse the dialyzer.

2. Reused dialyzer is better alternative.

3. Maintained the blood pressure to normal level.

All patient responded to treatment and completed dialysis successfully.

2 (4%) patient had dialysis disequalibrium syndrome i.e. nausea vomiting, disorientation tremor. (In severe case cardiac arrhythmia, seizures and coma may also occur). Patients presented with these symptoms towards the end of dialysis.

DDS was noted in 3-5% of patient undergoing hemodialysis. Arieff AI, Dialysis Disequilibrium Syndrome: Current concept of Pathogenesis and Prevention. Kidney Int. 1994 ; 45 ; 629-635.

In this study, one out of two patients was having malignant hypertension (i.e. BP of 200/100 Hg with papalliedema). (PT presented with nausea, vomiting, disorientation and seizures). Malignant hypertension is risk factor for dialysis disequlibrium syndrome.

Second patient was having CRF and he was on maintenance hemodialysis with markedly raised blood urea (210mg%) and S. creatinine (11.0 mg%)

Markedly raised blood urea and serum creatinine are also risk factor for DDS.

Possible Causes of dialysis disequlibrium syndrome.

Rapid hemodialysis :- As patient was having BP > 180 at time the of dialysis therefore blood - pump speed of 300 rpm was started. This caused rapid change in blood urea / S. creatinine level resulting in Dialysis Disequilibrium Syndrome.

Possible risk factors for DDS

1. Patient with pre-existing neurological disorders such as stroke.
2. Head trauma.
3. Sub dural hematoma
4. Malignant hypertension.

Steps for prevention of DDS :

1. Slow dialysis
2. Sequential ultrafiltration.
3. Peritoneal dialysis
4. Adding glucose, glycerol or mannitol to dialysate.

The present study had less number of patient with DDS because dialysis being started at lower blood blood pump speed around (200rpm) and then gradually increased to above 300 rpm.

Secondly controlled hemofiltration was performed.

Thirdly no patient had risk factors for DDS , i.e. recent stroke, head injury, sub-dural hemotoma for dialysis.

Treatment given -

- Slowing dialysis
- Inj. mannitol 200 ml iv over 2 hours. Patient responded towards the end of dialysis

In this study 3 (6%) patient had fever (Temp > 99°F) during dialysis.

* Fever and chills occurs in <1% of patient undergoing hemodialysis. Harold Bregman, John T, Daugirdas and Todds. Ing. In Handbook of dialysis 1988 ; 106-108

* Richard Amerling , Gil A., Cu, Alan Dubrow, Nathan W. Levin, Raphel J. Osheroff reported fever occur in less than <1% of patient undergoing hemodialysis. (In Clinical Dialysis. 3rd ed. 1995 ; 236-237).

* A recent report from Centre for Disease Control (LDC) found pyogenic reactions (in absence of septicemia) in 20% Centre. The incidence was higher in centres using high-flux dialysis and reprocessing of dialyzers, and was highest in units where the maximum number of reuses was 40 or more. Tokass JI, Alter MJ, Favero MS, Moyer LA, Bland LA, National Surveillance of hemodialysis associated diseases in united states 1990, ASAIO J. 1993 : 39 (1) ; 71-80.

Possible causes of fever in present study.

1. Re-use of dialyzer ; we are using one dialyzer about 4-5 times.
2. The dialysate supplied might be contaminated.

Treatment given

Inj. paracetamol was given and patients got relieved of fever.

A cluster of similar cases should prompt a review of the water used for reprocessing and dialysate, the reprocessing procedure, and the bicarbonate system.

Flaherty JP, Garcia - Houchins S. Chudy R., Arnow An our break of gram-negative bacteremia traced to contaiminated o-rings in reprocessed dialyzers Ann Intern. Med. 1993 : 114 : 1077-1078.

Prevention of Fever

The AAMI recommends that water for dialysate or reprocessing have bacterial count of less than 200 cfu/ml and endotoxin level must be less than 5 endotoxin unit or 1 ng/ml using Limulus ameocyte lysate assay. Prior to cannulation the graft or fistula must be inspected for erythema, warmth, tenderness, or mass to detect infection. The skin al site of cannulation must be scrubbed with povidone iodine or

chorhexidine , which should be allowed to dry for 5 min before cannulation sterlization of dialyser can be accomplished by exposure to formaldehyde heat or glutaraldehyde.

In this study 2 (4%) had itching during hemodialysis.

Itching complicates 5% of patients during hemodialysis. Herold Bregman,John J. Daugirdas and Todd. Ing. In Handbook of dialysis 1988 ; 106-107.

Possible cause of Itching in present study -

1. Heparin - used as anticogulant, acted as an allergens.
2. Ethylene oxide gas usedto sterlize many types of hemodialyzers and blood lines also acted as an allergen.
3. Formaldihyde used as sterilant might also be responsible for itching.

Treatment given -

Antihistaminics (cetrizine) were given and patients got relieved of itching.

1 (2%) out of 50 patient was noted to had irregular pulse - during dialysis, earlier on he had normal pulse. On ECG, atrial fibrillation was found. This was patient of CAD.

Atrial and ventricular arrhythmias are common during hemodialysis. Kantt K.S. : Intradialytic cardiac arrhythmias II, Semin Dial. 1994, 7 : 58-60.

Eighty percent of recorded sudden deaths in intradialytic period are due to venticular fibrillation. Chazan J, sudden death in patient with chronic renal failure on hemodialysis, Dial Transplant -1987:16:447-48. That patient with irregular pulse (AF) got normalized by end of dialysis by itself.

Atrial and ventricular arrhythmias are common during hemodialysis. Bailey RA, Kaplan AA.,

Intradialytic cardiac arrhythmias II, Semin Dial. 1994, 7 : 58-60.

LVH, CAD, hypokalemia, hypomagnesemia are contributing factor to intradialytic arrhythmias. Kant KS, Intradialytic cardiac arrhymias II. Semin Dial. 1994 : 7: 57-58.

Possible causes of arrhythmias in present study :-

This patient was having coronary artery disease with LVH, that might be the cause of arrhythmias in this patient. Other causes of arrhythmias are -

1- Left venticular hypertrophy (especially in presence of digitalis).

2- Hypokalemia.

In the present study less cases of arrhythmias were because of less patients of CAD , LVH undergoing hemodialysis in dialysis unit.

In this study 2(4%) patient had muscle cramps during dialysis.

6 - 11% of patient had cramps during hemodialysis. Richard Amering, Gil A. Cu, Alan Dubrow, Nathan W. Levin, Raphael J. Osheroff. In Clinical Dialysis Appleton and Lange, 1995 : 235-237.

Harold Bregmann, John T. Daugirdas and Todds Ing reported, 5-20% patients were reported to have cramps during hemodialysis. (In Handbook of dialysis 1988 : 106-108).

In voluntary sustained conctraction cramps are common intradialytic event accounting for 12% of treatment. Levin NW, Kupin WL, Zosuwa, Venkat KK. Complications during hemodialysis. In Clinical Dialysis 2nd eds. Norwalk Conn. Appleton and Lange 1990 : 172-201.

Cramping usually occur late in dialysis treatment. Coinciding with vigrous contraction of plasma volume. It may indicate hypotension. (Blagg C. Acute complications associated with hemodialysis. In Maher J. eds. replacement of Renal Function by Dialysis : A

textbook of dialysis. Dordrecht Holland : Klunwer Academic 1989 : 750-751).

Possible cause of cramps in this study

Hypotension might be the cause for cramps during hemodialysis.

Other causes of cramps

- Use of sodium poor dialysis solution.
- The patient being below dry weight i.e. patient was dehydrated.

We had less patient with cramps because we treated hypotension immediately by giving i/v normal saline i.e. hypotension was not allowed for long time.

Treatment given

Hypertonic saline was given

Dialysis speed was reduced

All patient got relieved of cramps.

Headache was noted in 2 (4%) patients undergoing hemodialysis in this study.

5%patient reported headache during hemodialysis. Harold Bregman, John T. Daugirdas, and Todd S. Ing. In Handbook of Dialysis 1988 : 106-107.

Possible cause of headache in this study -

1. *Hypotension -* Both the patients complaining of headache were found to have hypotension.
2. Headache might be subtle manifestation of dialysis disequilibrium syndrome caused by rapid dialysis.

Treatment given

- Hypotension was treated by giving intravenous normal saline
- Acetaminophen was given during dialysis.
- Both patient relieved of headache.

Bleeding from operated side was noted in 1 (2%) patient

Possible cause was heparin as anticoagulant

Treatment given :

- Heparin dose was reduced.

Summary & Conclusions

SUMMARY & CONCLUSIONS

The present study was done to study incidences of complication during hemodialysis, their treatment and outcome, in the dialysis unit of the Department of Medicine M.L.B. Medical College, Jhansi.

50 patient of renal failure out of 9050 patient admitted in medical, surgical and Obst & Gynae. wards in last one year (December 2000 - December 2001) were selected for the study.

All 50 patients were properly monitored during dialysis in terms of any complication during dialysis such as nausea, vomiting, muscle cramps, dialysis disequilbrium syndrome, fever, hypotension, hypertension, cardiac arrhythmias , hyperglycemia, hypoglycemia , itching, headache, chest pain or any bleeding disorders. Every complaint made by patient was properly attended, followed and treated.

Following conclusions were drawn from the study.

1. 28 (56%) patients had one or more complication during dialysis where as 22(44%) completed dialysis without any complications.

2. Hypotension was noted in 7(14%) patients undergoing dialysis.

   Possible causes of hypotension were

   - Use of acetate as dialysis solution.
   - High temperature of dialysis solution.
   - Patient taking antihypertensive medicine
   - Patient having any cardiac disease.

3. Hypertension was noted in 1(2%) patients

   Possible causes of hypertension

   - Pre-existing hypertension.
   - Removal of antihypertensive medication by hemodialysis.
   - Fluid overload.

4. Nausea was noted in 7(14%) and vomiting in 4(8%) patients.

Possible causes of nausea and vomiting

- Rapid hemodialysis causing DDS.
- Hypotension contributed to nausea and vomiting.

5. Dialysis disequlibrium syndrome was noted in 2(4%) patients

Possible causes were

- Rapid hemodialysis
- Malignant hypertension was risk factor for DDS.

6. Fever was noted in 3(6%) of patients

Possible causes were

- Reuse of dialyzer.
- Contamination of dialysate.

7. 2(4%) patient had itching during hemodialysis possible cause

   - Heparin acted as allergen.
   - Formaldehyde use as sterilant also acted as allergen.

8. 1 (2%) was found to had irregular pulse (on ECG - Atrial fibrillation)

   - Coronary artery disease was possible cause of A.F.

9. 2 (4%) patient had muscle cramps

   - Hypotension might be the cause of muscle cramps.

10. Bleeding from operated site was noted in 1 (2%) of patient.

    Possible cause of bleeding

    - Heparin as anticoagulant.

11. 28 (56%) patient who had complication during hemodialysis required intervention for treatment.

    All 28 patients successfully completed dialysis.

12. There was no mortality during dialysis.

    This shows that because of ultrafiltration control, bio compatible membranes, more sophisticated mach-ines, hemodialysis today is relatively safe but yet much work is needed to make hemodialysis truely complications free.

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Working Proforma

PATIENT ON HEMODIAYSIS

Consultant / Guide-
Dr. P.K. Jain
MD, MNAMS

Co - Guide
Dr. N.S. Sanger
DM

Resident
Naveen Bhatt

Patient Name :_____ Age / Sex :_____Address:_____

Indication of Hemodialysis _____

Routine Investigation	Date of Hemodialysis	Predialysis Investigations	Post dialysis Investigation
Other Investigation			

DEPARTMENT OF NEPHROLOGY, M.L.B. MEDICAL COLLEG, JHANSI

Progress of Patient during Hemodialysis

Time	Blood Pressure	Heart Rate	Temperature	Pump Speed	Heparin Infusion	Any Complications Remarks

Treatment of Complication and its outcome.

Master Chart

MASTER CHART

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Compli ation	Treatme tn given	Outcom e
1	Guddu	18y M	567	3.1 2001	Dr. P.K. Jain	CRF with fluid overload	NAD	234	11.85	125.2	5.80	66(F)	Gra. Cast +	RK-83 LK-79	110	Hypote nsion	Reduced Blood pump speed	Normal
2	Ramesh	19y M	669	6.1.2001	Dr. P.K. Jain	CRF with fluid overload	NAD	160.4	10.80	128	4.8	79(F)	do	RK-83 LK-79	96	No Compli cation		Get Normaliz ed
3	Munnalal	35y M	961	Referred case from Surgery	Dr. R.P. Kala	ARF with Blunt trauma abdomen	NAD	172	5.2	129	4.8	140 (R)	Albumin ++ Sugar traces Pus cell	Normal Kidney	88	Minor Bleedin g from operate d side	Inj 25% D 1AMP i/v stat	Get Normaliz ed
4	Lexmi Devi	40y F	3519	6.3.2001	Dr. P. Kumar	ARF with septicemi a	NAD	126.4	3.0	129	4.7	69.5(R)	NAD	Norma l	50	No Compli cation		
5	Indernath	72y M	3493	6.3.2001	Dr. N,S. Senger	ARF with Cardiom yopathy with CHF	NAD	160	5.2	130	5.2	90(R)	Albumin RBC-OCE Rest-NAD	ECHO: LVH	110	No Compli cation		
6	Parshu	16y M	3652	10.3.2001 referred case from surgery	Dr. D. Pratp	Lump in Abdomen with ARF (ATN)	NAD	166.4	3.75	128	6.04	270 (R)	Puscell 8-10	Normal	102	No Compli cation		
7	Maniram	55y M	3712	13.3.2001	Dr. N.S. Senger	CRF with Diabetes	Diabetes Ratinopa hy	204	6	140	6.02	67(R)	NAD	RK-83 LK-79	120	Nausea Vomitin g	Inj Ondem I/V stat	No complica tion
8	Ramwati	22y F	3761	14.3.2001	Dr. P. Kumar	ARF	NAD	109	2.2	124.9	5.6	92(F)	NAD	Normal	92	Irregula Pulse on ECG AF	Get normaliz ed itself	Normaliz ed No Complic ation

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Complication	Treatmetn given	Outcome
9	Kamta	60y M	3679	11.3.2001	Prof. R.C. Arora	FVC AMI with ARF	NAD	140	6	130	5.8	10(R)	NAD	ECHO: LVH U/SBIH	86	No Complication		
10	Nizam	22y M	3961	16 3.2001	Dr. P.K. Jain	ARF with ANURIA	NAD	109	7.2	128	5.6	316 (R)	Puscell 8-10	Normal	90	Nausea Vomiting (DDS)	Inj Ondem I/V stat	
11	Kailas Narayan	45y M	3800	12.3.2001	Dr. N.S. Sanger	CRF with Fluid overload with Diabetes Mellitus	Diabetes Ratinopahy	201	7.0	130	5.2	170 (R)	Puscell 8-10	RK-82 LK-81	102	No Complication		
12	Rameshwar	50y M	884	23.1.2001	Dr. Navneet Agarwal	CRF with Hyper-tension	Grade II hypetension charge	168	8.2	134	6	168 (R)	Albumin +	RK-82 LK-81	92	No Complication		
13	Ram Bitoli	50y M	884	23.1.2001	Dr. P.K. Jain	CRF with Hyper-tension	Grade II hypetension charge	152	7	136	6.2	190 (F)	Albumin +	RK-79 LK-82	90	Hypotension	Increased speed of pump	Normalized
14	Urmila	40y F	80	4.2.2001	Dr. P.K. Jain	DM with SHT with CRF	Diabetes Ratinopahy	199	8.4	124	5.6	176 (F)	Albumin +	RK-83 LK-76	150	Hypotension	Food end raised	Normalized
15	Fasel Naseem	32y M	1974	8.2.2001	Dr. N.S. Sanger	DM with SHT with CRF	Diabetes Ratinopahy	181	4.2	134	5.2	92 (F)	Albumin ++	RK-81 LK-72	161	Hypotension		
16	Bhaiya Lal	22y M	2059	11.2.2001	Dr. N.S. Sanger	CRF with Fluid Overload	NAD	201	6.2	127	6.8	76 (R)	Albumin ++	Normal	92	Nausea Fever Itching	Get NS I I. IV	Normalized
17	Rambala	70y M	2733	12.2.2001	Dr. N.S. Sanger	ARF with port of Prosta	NAD	96	4.6	132	5.6	101 (R)	Rest Nil	RK-79 LK-82	80	No complication		Normalized
18	Devendra	40y M	2335	13.2.2001	Dr. P.K. Jain	CRF	NAD	172	6.7	120	4.6	176 (R)	Rest Nil	RK-83 LK-76	180	Muscle Cramp		

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Complication	Treatmetn Given	Outcome
20	Sukkhu	50y M	2009	26.2.2001	Dr. N.S Sanger	CRF with S. anemia with pulmonary TB	NAD	222	6.7	134	6.2	112 (R)	NAD	Normal	80	No complication		Normalized
21	Ramkunwar	47y M	10471	24.2.2001	Dr. P.K. Jain	ARF	NAD	172	7.2	140	6.0	270 (R)	Puscell 10-12	RK-79 LK-72	176	Muscle cramp		
22	Devendra	60y M	11357	15.8.2001	Dr. N.S Sanger	DM with CRF	Diabetes Ratinopathy	184	6.3	136	5.7	111 (R)	Albumin ++	RK-82 LK-69	102	No complication		
23	Maniram	50Y M	11648	18.8.2001	Dr. N.S. Sanger	CRF with S. anaemia	Grade II hypertesnion changes	176	8.2	128	6.5	112 (F)	Albumin ++	Normal	69	Hypotension		
24	Sheela devi	50Y M	11613	21.8.2001	Dr. P. Kumar	CRF with S. anaemia	NAD	162	72	132	4.0	112 (F)	NAD	RK-80 LK-72	110	Hypotension	Foot end raised	Normalized
25	Ramkumar	65Y M	12347	30.8.2001	Dr. N.S Sanger	CRFwith CHFwith Ant (Old) wall MI	NAD	222	5.6	142	56	96 (F)	NAD	RK-80 LK-76	176	Hypotension	Give NSI. Reduced speed of pump	
26	Shobaram	25y M	12694	3.9.2001	Dr. N.S Sanger	ARF with anaemia with fluid overload	NAD	196	6.2	142	6.1	102(F)	Puscell	Normal	92	Hypotension	Foot and raised NS IO I/V	Improved
27	Bhagwati	40y F	12895	5.9.2001	Dr P. Kumar	Malarial pyrexia with ARF	NAD	144	7.1	134	5.2	60(F)	NAD	Normal	104	No Complication		
28	Kaptan	52y M	13524	12.9.2001	Dr. N.S Sanger	Bobstructive Nephrology	Grade III Hypertensive changes	168	7.2	128	4.2	97(F)	Granular Cast+ Albumin ++	RK 83mm LK 76mm	76	Nausea / Fever	Inj mol 1 amp 1/m stat	Improved

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Compli cation	Treatment given	Outcome
29	Savitri Devi	40y F	12895	8.9. 2001	Dr. P. Kumar	CRF with Systemic Hypotension	NAD	121	6.5	130	4.2	69(F)	NAD	Normal	116	Leg cramps	Improved by itself	
30	Savitri Devi	20y F	13991	31.9.2001	Dr. N.S. Sanger	CRF with Systemic Hypotension	NAD	210	8.1	144	5.2	79(F)	NAD	R.Stone of 10mm in put Risk Kidney	104	No Complication		
31	Ramsingh	48y M	14281	31.9.2001	Dr. N.S. Sanger	CRF with anaemia	Hypertensive changes	192	7 6	142	6.1	89(F)	Albumin ++	RK 81mm LK 71mm	91	Nausea Vomitng		
32	Seeladevi	48yF	14700	2.10.2001	Dr. N.S. Sanger	CRF with SHT with DM	Hypertensive changes	180	6.2	136	5.2	99(F)	RBC+ Rest NAD	RK 81mm LK 71mm	88	Fever	Inj onden lamp I/V stat	Improve
33	Akhtar	65yF	15340	4.10.2001	Dr. P. K. Jain	CRF with Pulmonary TB	NAD	162	5.6	128	74	92(F)	RBC+ Rest NAD	RK 75mm LK 69mm	150	No Complication		
34	Bhagwati	45yF	15860	8.10.2001	Dr. N.S. Sanger	Systemic Hypertension with CRF	Diabetic Retinopthy	172	9.2	135	5.6	196(F)	RBC 10-12 Albumin +	Normal sizekidney hronic renal failure	104	Hypotension	Inj mol 10 mg i/v stat	improved
35	Prabha	50yF	15858	15.10.2001	Dr. N.S. Sanger	RPGN with Oliguria	NAD	196	11.2	128	4.6	121(F)	RBC 10-12 Albumin +	RK 81mm LK 82mm	104	No Complication		improved
36	Ranjana	20yF	15961	18.10.2001	Dr. N.S. Sanger	CRF with diabetes mellitus	Grade III Hypertensive Changes	152	7.1	136	4.2	96(F)	Granular Cast+ Albumin ++	RK 72mm LK 76mm	92	No Complication		
37	Shakeel Khan	31yM	16131	19.10.2001	Dr. N.S. Sanger	CRF with Systemic HT	Grade III Hypertensive Changes	191	6.2	136	5.2	88(F)	Rest NAD	Normal Size	68	Nausea		

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Complication	Treatmetn given	Outcome
38	Shakeel Khan	54yM	15924	21.10.2001	Dr. N.S. Sanger	CRF with Systemic HT	NAD	188	9.1	146	6.2	152(F)	Rest NAD	RK 82mm LK 79mm	77	No Complication		
39	Sheela	54yF	15924	21.10.2001	Dr. N.S. Sanger	CHF with Old Ant. Sp Wall	NAD	192	9.2	130	6.1	92(F)	Puscell 15-20/ HDF	RK 79mm LK 76mm	96	No Complication		Improved
40	Kausal	65yM	16451	24.10.2001	Dr. N.S. Sanger	Celphos poisoning with ARF	NAD	168	8.6	134	6.2	88(F)	NAD	RK 79mm LK 76mm	112	Chest Pain		
41	Kausal	25y M	16651	26.10.2001	Dr. N.S. Sanger	Celphos poisoning with ARF	NAD	172	7.2	136	6.1	152(F)	NAD	RK 81mm LK 72mm	92	No Complication		
42	Babloo	25y M	16651	30.10.2001	Dr. N.S. Sanger	ARF with multiple renal stone left kidney	NAD	222	11.01	142	5.2	92(F)	RBC 4-6/ HDF Albumin ++ Sugar Traces	Normal	101	Increased Respiratory raised		
43	Babloo	65y M	16809	30.10.2001	Dr. N.S. Sanger	Malaria pyrexia with ARF with S. anemia	NAD	204	10.1	140	6.2	88(F)	RBC 4-6/ HDF Albumin ++ Sugar Traces	Normal	92	No Complication		
44	Rani Mishra	11y F	16563	3.11.2001	Dr. P.K. Jain	Malaria pyrexia with ARF with S. anemia	NAD	186	9.5	130	6.1	91(F)	RBC 4-6/ HDF Albumin ++ Sugar Traces	Multiple Rest stone in left kidney	72	No Complication		
45	Rani Mishra	11y F	17355	4.11.2001	Dr. N.S. Sanger	Pub TB with MS with CRF	NAD	172	11.5	126	5.2	88(F)	Puscell 15-20/ HDF	Normal	86	No Complication		

No.	Name	Age/ Sex	MRD No.	Date of Ad.	Clinical Incharge	Diagnosis	Fundus	Blood Urea mg%	S. Creat.	S. Na^+	Serum K^+	Blood Sugar mg%	Urine Ex RM	Ultra Sound	Blood Sugar during dialysis mg%	Compli ation	Treatme tn given	Outcom e
46	Balkunwar	35y F	19357	6.11 2001	Dr. N.S. Sanger	Pub TB with MS with CRF	NAD	196	10.8	134	6.6	92(F)	NAD	RK 82mm LK 76mm	104	No Complic ation		
47	Maya	38y F	18356	18 11 2001	Dr. P.K. Jain	Pub TB with MS with CRF	NAD	184	9.2	136	4.7	86(F)	NAD	RK 82mm LK 76mm	96	No Complic ation		
48	Rampyari	37y F	17990	17.11.2001	Dr. P.K. Jain	Pub TB with MS with CRF	NAD	170	8.8	142	4.6	90(F)	RBC 4-6/ HDF Albumin ++ Sugar	RK 82mm LK 76mm	81	Nausea Vomitin g	Inj Ondem IV Stat	
49	Rampyari	17y F	17958	20 11 2001	Dr. P.K. Jain	Pub TB with MS with CRF	NAD	88	6.2	136	5.2	107(F)	NAD	RK 82mm LK 76mm	101	Headac he		
50	Sangeeta	2y F	17989	20 11 2001	Dr. N.S. Sanger	Septa Abortion with CRF	NAD	150	16.2	150	5.6	106(F)	NAD	Normal	81	No Complic ation		